

## Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



117  
Ec7Fog  
C74  
C74

LIBRARY  
CONSERVATION RECORD  
OCT 16 1947  
U. S. DEPARTMENT OF AGRICULTURE

# Foreign AGRICULTURE

REVIEW OF FOREIGN FARM POLICY, PRODUCTION, AND TRADE

VOLUME 11, NO. 10

OCTOBER 1947

## IN THIS ISSUE

	Page
CHINA'S AGRICULTURAL-IMPROVEMENT PROGRAM . . .	130
Background . . . . .	130
Measures of the National Government . . . . .	133
Chinese Communists' agrarian program . . . . .	139
RESEARCH AND PRACTICE IN LEY FARMING . . . . .	141
Golden Age . . . . .	141
A livestock country . . . . .	142
Plant-breeding work . . . . .	142
CANADIAN FARM-REHABILITATION POLICY . . . . .	143

# China's Agricultural-Improvement Program

by RAYMOND T. MOYER\*

The assertion is often made that the development of its agriculture is of vital concern to China, because 70 percent of the nation's population are engaged in farm activities. There are other important reasons. A steady development of industry, which is essential to an expansion of trade and the raising of general living standards, is in turn dependent upon a simultaneous development of agriculture. Moreover, internal stability will not be achieved unless economic conditions in rural areas improve. What is being done to improve China's agrarian economy, therefore, is of interest both to China and to the United States. In this article the author reports his observations, made recently while serving in China on the China-United States Agricultural Mission,<sup>1</sup> on the efforts of the Chinese Government to bring about such improvement.

## Background

An evaluation of the adequacy of any agricultural-improvement program must be made against a background of the important basic problems present in the situation and of the essential objectives which such a program ought reasonably to attempt to achieve. For China, these are seen to be the following:

### BASIC PROBLEMS

**Agricultural Diversity.**—An observer able to travel through the different parts of China would quickly notice one of the characteristics of China's agriculture which a national program to improve agriculture must first take into account, namely, its diversity. Little agriculture is carried on in the arid outlying Provinces in the far northwest, representing roughly 40 percent of the total area of China, of which barren mountains and deserts comprise a major part. Eastward from these Provinces is a border region in which rainfall is too scant for the successful cultivation of crops;

but a cover of grass permits the grazing of sheep, cattle, and horses. In the rest of China, which supports over 90 percent of the population, cultivated agriculture predominates.

Here, almost universally, one finds the familiar pattern of a small farm, cultivated with an excessive use of hand labor and devoted largely to the raising of grain and fiber crops; but there are important differences in its agriculture. About one-half the farmers in this region raise mainly wheat, millet, kaoliang, soybeans, cotton, and corn; the remaining half raise principally rice, barley, sweetpotatoes, wheat, cotton, and corn. There also are wide differences in precipitation, temperature, soils, work animals, horticultural crops, and other factors, such as the extent of tenancy.

The problems with which an agricultural program has to deal, therefore, vary a great deal in the different parts of China.

**The Small Amount of Cultivable Land.**—The amount of land under cultivation in China is frequently placed at about 210,000,000 acres. An estimate by Buck<sup>2</sup> places it at 232,000,000 acres, for China exclusive of the Northeast Provinces (Manchuria) and Taiwan (Formosa). Exact figures are unavailable, but results of the current land-registration programs of the Government make it clear that the amount has been underestimated, probably by a substantial percentage.

In relation to the number of farmers, in any case, the amount of cultivable land is extremely limited. The most reliable figures available indicate that the average size of farm for all China is about 4.2 acres. The average size in the northern areas, where wheat growing predominates, has been found to be about 5.6 acres; in the rice-growing regions, it is about 3.1 acres. Because of the variation in size of farms, the majority of farmers cultivate even less than these averages. A limited amount of undeveloped land can still be opened up for cultivation, particularly in the Northeast Provinces and in the Southwest; but even if all of it

\*Office of Foreign Agricultural Relations.

<sup>1</sup>A joint mission, created for the purpose of recommending a national agricultural program and the services needed to implement it, in which the United States Government participated at the request of the Chinese Government. The work of this mission was begun in June 1946 and completed in November of the same year. Its report is now available to the public.

<sup>2</sup>BUCK, J. LOSSING. LAND UTILIZATION IN CHINA. 3 v. Chicago. 1937.



were completely utilized at once, the average size of farm could not be very greatly increased.

The inevitable result of this situation is low production per individual farmer and, consequently, a low income. This basic limitation of land in relation to the number of farmers is the most serious problem of China's agriculture now, and it will probably continue to be the most serious in the future.

**Farm Practices.**—Chinese farmers use certain types of farm equipment and employ other practices which sometimes are interpreted to mean that China's agriculture is primitive. Such, however, is not the case. Yields of the principal crops compare favorably with yields of the same crops in the United States; and a careful study of all the factors in a local environment often leads to the conclusion that many present practices of Chinese farmers are sound for their conditions, particularly those employed to produce field crops and vegetables. Furthermore, under the prevailing conditions there are a large number of natural and economic factors to which the present crops and livestock and the methods of handling them are in some measure adjusted, through centuries of trial and error and natural selection, and to which any practice must in some way be adjusted.

This means that care must be exercised in making recommendations for improvement. Relatively few innovations can safely be recommended without careful prior testing, usually over a period of years, to make certain of their adaptability and practical usefulness under existing conditions.

**Marketing, Farm Credit, and Taxation.**—A large number of the present marketing arrangements are very simple; and a great deal of the marketing of agricultural products follows procedures which have been used for centuries, without much benefit of modern practices. These procedures have been relatively effective and satisfactory, to both producer and consumer, in the marketing of many types of agricultural products and materials produced and consumed locally. More serious fault may be found with the way products destined for more distant markets are marketed. Middlemen are unnecessarily numerous, warehouses and available credit are inadequate, and good packing and storage facilities are often unavailable. Most important of all, suitable means of transportation do not exist, either to transport crops to local markets or to move them to larger consuming centers.

As a result, unnecessary waste and spoilage occur before the product is utilized by the ultimate consumer; surpluses accumulate in some places while deficits exist in others; farmers, forced to sell at a disadvantage, receive too small a share of the value of their products; and the nation goes without the benefit which could be had from a more effective utilization of its present and potential capacity to produce from the land.

Interest rates in China have been high for many years. Reasons for the high rates have been a shortage of money available for lending, the risk of loss taken by the lender, and a high cost of extending credit resulting, in part, from the small size of individual loans. During and since the war, as a result of inflation and a steady decrease in the purchasing power of Chinese currency, rates have greatly increased, to the point that a fairly safe investment may now command as much as 10 percent per month when loaned from private banks or small money lenders. Rates charged by Government banks have been substantially lower. In either case, the use of credit under present conditions adds substantially to the cost of producing and marketing agricultural commodities.

Income derived from the taxation of cultivated lands forms one of the principal sources of revenue of the Chinese Government, whether on the national, provincial, or local level; and taxes on land often put a heavy burden on farmers. Although rates prescribed by the National Government usually would not be considered excessive, special levies frequently are added for local government, military, or other purposes. It also is the case in many communities that the ownership of substantial quantities of land has not been registered, and taxes therefore have not been collected equitably. An additional reason for grievance on the part of the farmer is the small percentage of his tax payments being expended for purposes which directly benefit him. An important step will have been taken toward raising rural living levels when taxes are collected on an equitable basis, when farmers are not required to meet special levies, and when a much larger proportion of the taxes collected on land are used for highways, irrigation systems, schools, agricultural extension work, and similar services that improve the welfare of people in rural communities.

**Tenancy.**—A considerable amount of public attention has been drawn to the problems of farm tenancy in China, in part because of the promi-

nence accorded to land reform in the agrarian program of the Chinese Communists.

Some wrong impressions, however, have grown up with respect to this problem. Statements have been made that the larger part of the farm land in China is cultivated by tenants. In a study of 16,796 farms in 168 localities in different parts of China, Buck<sup>3</sup> found that about 29 percent of all the farm area was rented; the remaining 71 percent of the land was cultivated by owners. Of the farmers tilling the land of the 16,786 farms, 17 percent were tenants, 29 percent were part owners, and 54 percent were full owners. In the United States, in 1940, about 39 percent of all farmers were tenants, 10 percent part owners, and 51 percent full owners. In China the amount of tenancy varies a great deal regionally. In the wheat-growing region of North China, where about one-half the farm population of China live, only 12.7 percent of the farm area was found to be rented, leaving 87.3 percent farmed by owners. In the rice-growing regions, a little more than 40 percent of all the land was found to be rented.

While the number of localities studied in this investigation may not have been sufficiently numerous to show the extent of tenancy in China with complete accuracy, no sound reason has been found to doubt that these figures show the true situation in its general outlines.

Information is not sufficiently complete to allow a generalized statement with respect to the fairness of existing arrangements between tenant and landlord. There are situations on record where the responsibilities and the returns are shared equitably. There are many others where, because of a scarcity of land available for renting, tenants compete among themselves for the privilege of renting; and landlords, taking advantage of the demand, exact unjust terms. The condition of the tenant is usually made worse in cases where agents collect the rent for an absentee landlord, when both tenant and landlord may be cheated. Other forms of advantage are sometimes taken of the tenant, such as the exaction of labor without compensation, the payment of rents before the crop is harvested, and a requirement that tenants borrow from the landlord any money which they require.

A fundamental difficulty in this situation is the small size of the farm. When a farm of 100 to 160 acres is rented, as often happens in the United States, the output of the farm can provide a fair

return on the landlord's investment and, at the same time, a good living for the tenant. When the output of a farm of 3 to 6 acres must be shared, the part remaining for the tenant to live on is very meager, regardless of how fairly he may be treated by the landlord.

### ESSENTIAL OBJECTIVES

China's farmers will achieve an improved standard of living only to the extent that they secure financial resources over and above what is required to provide them with the minimum essentials of food, clothing, shelter, and materials needed to operate the farm. When farmers have a surplus above this bare minimum of necessities, they can pay for education, medical services, and manufactured goods, which would add to their health, comfort, convenience, and cultural advancement.

From a consideration of the characteristics and problems in the agriculture of China which have been presented, it is obvious that no one panacea or single cure-all will solve the economic problems of China's farmers and bring about the development of agriculture in the interest of the public welfare. To accomplish this will require a broad program, calculated to achieve the following results.

**An Increased Production Per Farmer.**—The first requirement of an agricultural program adequate for China is that it shall help Chinese farmers individually to produce more. If their financial resources are to be increased, they must have more to sell. American farms, in 1940, contained an average of about 87 acres in cultivated crops and plowable pasture, the average size of farm including land devoted to all purposes being 174 acres. The relatively high income of farmers in the United States is based fundamentally on the high production per person made possible by these large farms; and the economic improvement of farmers in China must rest at bottom on an increase of per capita production.

Limited basically by the amount of cultivable land available in China, already described, it cannot be expected that this increase in per capita production will be achieved through a material increase in the average size of farm. It may be argued that a growing industry and the development of various services will reduce the farm population and allow those who remain as farmers to increase their acreage. However, the experience of a number of countries has shown, as in the case

<sup>3</sup> See reference cited in footnote 2.



of Japan, that even a rather rapid rate of industrialization has accomplished no more in this respect than to absorb the increase of population. The numbers left in agriculture have remained about the same. Some have suggested that a thorough land-reform program would help to meet this difficulty, but land reform affects only the ownership of land; it does not increase the amount.

An increase of per capita production, therefore, will have to come about principally through the use of the improved techniques in farming which increase the output per unit of land. Some of the means which can bring this about will be found in an increased use of irrigation, chemical fertilizers, scientific control of plant diseases and insect pests, higher yielding varieties of crops, better breeds of livestock, veterinary science, improved farm management, better methods of tilling crops and raising livestock, soil and water conservation, forest-tree planting, and the improvement of farm implements. Opinions differ with respect to the amount of increase which can be effected through a full utilization of these methods, but on most farms output could probably be increased from 30 to 50 percent.

**Larger Net Returns to the Farmer.**—A second basic requirement of an adequate agricultural program must be that it provide services and conditions which enable the farmer to obtain and have for his own purposes larger returns from the sale of what he produces. Under conditions now prevailing with respect to marketing, farm credit, taxation, and land tenancy, Chinese farmers often receive too small a share of the value of their products, and they pay to others an unduly high proportion of the returns which they do receive. Unless improvements are introduced to correct this situation, technical improvements to increase production will have relatively little effect in raising the actual living levels of China's large rural population. Opinions vary as to whether measures to meet this situation or measures designed to increase production will do more to improve the welfare of farmers. Both are essential.

**Production in Line With National Needs.**—A logical agricultural program, designed to serve the public welfare, will guide the development of agriculture in line with national requirements. The following needs are important: A planned utilization of soil resources for that type of production which will preserve these resources for a permanent use; the production of the food, fiber,

and forest crops needed to provide improved standards of consumption and housing, to the extent that it is economically sound to produce rather than to import these commodities; the production, for export, of crops in which China has a natural advantage and which can be produced in excess of domestic needs; and the production of fibers, oilseeds, animal products, and forest products needed as raw materials for China's developing industries.

## Measures of the National Government

Isolated projects designed to improve China's agriculture by scientific methods were begun by the Government of the new Chinese Republic and private agencies as early as 1915; but systematic efforts by the National Government were first undertaken on a broad scale after it had consolidated its position, about 1930. An important forward step was taken in the founding of the National Agricultural Research Bureau in 1932, which established research work in plant industry, animal industry and agricultural economics. A separate Ministry for agriculture, the Ministry of Agriculture and Forestry, was created in 1940, emphasizing agricultural research and extension.

During this period important functions related to the development of agriculture also were gradually established under other agencies of the Government. The most important of these now functioning are: Agricultural education, under the Ministry of Education; a soil-survey program, under the National Geological Survey of the Ministry of Economic Affairs; land programs, under the National Land Administration; cooperatives, under the Ministry of Social Affairs; river control, under the National Conservancy Commission; work on market grades and standards, under the Ministry of Economic Affairs; and the development of irrigation, fertilizer production, and electrification, under the National Resources Commission. In addition, a number of Provincial governments have established agricultural experiment stations and agricultural colleges, and they have promoted other projects, such as the construction of irrigation facilities.

### TYPES AND ACCOMPLISHMENTS

**Agricultural Research.**—In the Government's effort to improve agriculture, emphasis has been

wisely placed on research. Improvements cannot be recommended to farmers without first determining their adaptability under local conditions, and pointed instruction in agriculture requires not only a knowledge of principles but also of how these principles apply in China. A good deal of the early work in agricultural research in China was done by agricultural colleges, by Provincial experiment stations and laboratories, and by individual stations of the National Government set up on a limited scale. Many of these efforts proved to be poorly conceived and planned, or unrelated to important practical problems, so that relatively few results of importance were obtained. Research projects undertaken during the past 15 years, however, have been among the most useful and soundly developed parts of the National Government's agricultural-improvement program.

One of the first efforts to be carried out successfully was in plant breeding. This was begun on a large scale by the University of Nanking, in cooperation with the Department of Plant Breeding of Cornell University, and by the National South-eastern University. Work along similar lines subsequently was undertaken by the National Agricultural Research Bureau on an expanding scale, in cooperation with a number of Provincial stations. As a result of these efforts, improved varieties of the most important food crops and of cotton have been made available and now are being planted in most of China's Provinces.

Substantial accomplishments also have been achieved in the classification and mapping of the soils of China. Field and laboratory work was begun about 1930 in a reconnaissance survey of the soils of the whole of China, which has been completed. During the war, surveys of a number of regions in China's hinterland were made in greater detail. The results of a considerable amount of sound work in the study of China's soils is now recorded in a series of soil bulletins and other publications.

Utilizing the information gained in these surveys, an effort was made to determine responses to the application of nitrogen, phosphorus, and potassium on the principal soil groups of China. In this investigation, several hundred well-conducted field experiments, in about a hundred different localities, have been completed. These experiments provide the basis for recommendations with respect to fertilizer application. They also provide basic information needed for planning a

program of fertilizer manufacture, now being contemplated.

An important activity being carried out by the National Agricultural Research Bureau is the gathering of crop and livestock statistics. This was initiated in 1929 and expanded until, in 1937, there were 6,300 crop reporters. The accuracy of the statistics reported does not as yet meet the desired standards, but the foundation for a satisfactory crop- and livestock-reporting system appears to have been laid.

Sound projects in research have also been begun on sericulture, insect control, plant-disease control, citrus improvement, soil and water conservation, and agricultural engineering. A less satisfactory beginning seems to have been made in forestry, animal husbandry, and fisheries. An outstanding piece of work, investigating problems of land utilization, has been carried out under the direction of the Department of Agricultural Economics, Nanking University, and good research work in this field has been done by a number of other universities, notably the Economics Research Institute of Nankai University; but the investigation of problems in the general field of agricultural economics still needs considerable development.

**Agricultural Extension.**—A national extension service, with a nation-wide program, was first established after the outbreak of war with Japan. Following some changes in organization, a National Agricultural Extension Commission was established in 1945, under the Ministry of Agriculture and Forestry. In 1946 there were extension offices in 485 hsien (counties) of 14 Provinces, or in about one-fourth of the hsien of China. The program has emphasized efforts to promote the use of improved seeds and other practices designed to increase the production of major food-stuffs and cotton.

An important weakness in this service has been the lack of an adequate concept of what it can perform. By too many people it has been thought of mainly as a means to make physically available to farmers the improved seeds and other materials developed by experiment stations, rather than as an educational effort designed to help farmers recognize their problems, to let them know what information and help is available to them, and to assist them in getting the additional information and service they need. Moreover, many workers are neither experienced, nor adequately trained, nor greatly interested in agricultural work or farm



people, and the work of this agency has been poorly correlated with the activities of other organizations and agencies in this field.

On the other hand, no part of an agricultural program would seem to be more important at present than energetic, well-directed work in agricultural extension. Adequately conceived and organized, this program would promote the use of improved farming techniques, improved plant and animal stock, cooperative efforts, better diets, sanitary measures, recreational activities, and adult education. Chinese educational institutions and research centers already possess a great deal of information that might lead to improvement along these lines, but it is not yet generally applied on farms and in farm households. The prompt development of an adequate extension program, integrated with other efforts with farmers, might rapidly narrow the gap between knowledge now possessed and that which is adopted and generally applied in China's rural areas.

**Agricultural Education.**—A good start in agricultural education at the higher levels has been made in China during the past 30 years. In 1946 there were the following colleges of agriculture: 21 national, 7 provincial, and 4 missionary. There also were 8 other colleges offering specialized work in agriculture. These colleges, to date, have graduated more than 6,000 students, who have served in National, Provincial, and local governments, educational institutions, banks, business concerns, and other agencies in agriculture and related fields. A substantial number of students also have gone abroad for further training and experience.

Although the standards of instruction in agricultural colleges gradually was improving before the war, the need for further improvement was widely felt. The situation with respect to agricultural education in China at that time was similar in a number of respects to the situation in the United States when agricultural education first began. Local research had not yet established a sufficient body of information to provide the basis for pointed teaching; many of the textbooks were translations of textbooks written in other countries; students came largely from professional or Government families rather than from farms; laboratory and library facilities were inadequate; and the educational objectives often were not sharply defined. Standards of instruction naturally have been still lower since the outbreak of war with Japan. The influence of the agricultural

colleges on the development of China's agriculture, therefore, has not been so great as their number and the total number of graduates might suggest.

An additional reason for their limited influence has been the lack of an effective integration of the work done in agricultural research, extension, and instruction. This lack arises in part from the present system which places agricultural instruction under the Ministry of Education, whereas agricultural research and extension come largely under a second ministry, the Ministry of Agriculture and Forestry. None of these services, therefore, have received the stimulation which close contact with the others would afford, and their work has not been so pointed or so fruitful as it might otherwise have been.

Another factor which may have reduced the effectiveness of agricultural colleges is their large number in relation to the resources available for their support. While China at sometime in the future may need at least as many of these colleges as now exist, it would appear to be sounder policy at the present time to concentrate available resources on a smaller number, in which high standards and thorough training are provided.

Some attempts have been made to establish vocational schools of lower than college level, in order to train farmers and provide personnel for certain positions in extension work or cooperative organization, but work at this level thus far has not been notably successful.

**Land Programs.**—Problems related to the ownership of agricultural land are of unusual importance in China, where the tilling of land provides a livelihood for a large majority of the people and the taxation of land brings to the Government the major portion of its revenue.

Interest in problems of farm ownership has been shown by the National Government of China for nearly two decades, stimulated in part by the dictum of Sun Yat Sen that the land should be owned by the one tilling it. In 1930 a national land law was promulgated which included specific provisions looking toward an improvement in the position of the tenant. A second land law was promulgated on April 29, 1946, which incorporated many of the principles established in the law of 1930 and actions related to land that were taken later by the Executive Yuan. This is a comprehensive document dealing with land of all kinds.

With respect to agricultural land the law includes, among many others, the following pro-

visions: The transfer of ownership of private agricultural land shall be made only to a transferee in a position to cultivate the land himself; a tenant cultivating a piece of land continuously for 8 years may apply to the Government to buy the land, in his behalf, in cases where the owner is an absentee landlord; there shall be a progressive rate of taxation rising with increasing amounts of land owned; the annual rental shall not exceed 8 percent of the value of the land; and the subletting of land by a lessee and the collection of rent in advance shall be prohibited. Detailed regulations are set forth governing the relations between landlord and tenant; and provision is made for the survey, registration, and appraisal of all land.

It is clear from a review of the provisions of this law that it has been framed with the purpose of bringing about land reforms, and that it pays particular attention to safeguards which are in the interest of the tenant. Many of these provisions were included also in the land law of 1930, but efforts were not made to put them into effect; and no effort to put them into effect generally has yet been made.

During the war it was decided to experiment on a limited scale with procedures to help tenants become owners of land. Between 1943 and 1945 experimental projects along these lines were established in over 70 different hsien of 13 Provinces.

One of the most highly successful of these projects, at Peipeh, Szechwan, was visited by the writer. This project was carried out in a relatively small area through the combined efforts of the district government, the Farmers Bank, and the Ministry of Agriculture and Forestry. The entire landholdings of the landlords were acquired by the district government through forced sale and sold to former tenants, the transactions being financed by the Farmers Bank. The Ministry of Agriculture and Forestry assisted farmers to work out improved systems of farm management, gave technical advice on production, and helped organize cooperative efforts in irrigation, swine raising, and wine making. All the land of the area was carefully surveyed, registered, and appraised, and attention was paid to a consolidation of holdings in distributing it. Tenant farmers were provided with a loan to be repaid within 10 years, but these actually were repaid within 3 years.

Efforts in this project have been remarkably successful, as seen in improved economic condi-

tions, increased production, pride of ownership in land, incentive to greater production, and interest in the general welfare of the community. Those who formerly were tenants appeared to have become substantial citizens, with community interests and a sense of loyalty to the Government. Many of the other efforts to establish tenants as owners have failed. Success in this case appeared to have been achieved largely as a result of the enthusiasm and wisdom of the leadership, sound technical guidance, and the light financial burden which tenants had to assume in becoming owners, because of the inflation.

With the establishment of a legal basis for increasing ownership and regulating tenancy, and with the experience gained in these projects, a foundation would seem to have been laid for a considerable extension of programs to improve the condition of tenant farmers.

An important part of the Government's land program, basic to the establishment of equitable taxation, is the program of land survey, registration, and appraisal. This was undertaken before the war with Japan and is still being pursued. It constitutes the first careful effort of the Government to survey and register accurately China's cultivated land. One important result, already evident, is a demonstration that the amount of land actually under cultivation is greater than the amount formerly registered. In places visited, the amount of increase was reported to be between 20 and 30 percent. The registration of all the land makes possible a more equitable taxation. The new information also will provide a basis for much greater accuracy in the statistics of agricultural production. This work has already been completed or well started in a substantial number of hsien.

**Construction of Irrigation Facilities.**—A large proportion of the cultivated land of China is irrigated, some of it under systems which have existed for 2,000 years. Around 15 percent of the cultivated land in North China is under irrigation, which commonly increases yields of wheat, cotton, and other crops by 50 percent or more. In the rice-growing region, nearly 70 percent of the land is irrigated. In both the wheat and the rice regions, an adequate and dependable supply of water for irrigation is one of the most urgent needs of agriculture.

Recognizing the importance of irrigation, the National and Provincial Governments of China



have encouraged the construction of irrigation facilities. Although statistics to show the total extent of facilities recently constructed are not available, irrigation projects have been undertaken during the past decade in practically all Provinces not controlled by the Japanese. In Shensi Province, for example, work on two important projects along the Wei and Lo Rivers, under construction since 1934, will shortly be completed. In Szechwan Province, under the direction of a Bureau of Hydraulic Engineering, an energetic program of survey, planning, design, and construction has been under way since 1938. Projects completed by the middle of 1946 made possible the irrigation of about 125,000 acres. These include gravity-flow systems, detention dams, pond reservoirs, and pumping systems which provide irrigation water for upland fields on slopes. In Kwangsi Province, small-scale projects operated by private organizations, completed between 1932 and 1945, brought about 270,000 acres of land under irrigation, and provincial projects to irrigate 60,000 more acres were started during the war and are not yet completed.

Money to finance these programs was supplied by the Farmers Bank or local banks. In their construction, modern engineering principles have been used, and most of the systems are soundly built. The facilities already constructed are far from meeting the total need or utilizing the full irrigation potentialities, but an appreciable beginning has been made in a program to help farmers through this important service.

**Farm Credit.**—The Government's effort to supply farm credit has been made through the Farmers Bank. This bank was first established in 1933. At the close of the war with Japan, it had 743 business offices, offering loans for agricultural production and marketing and for the purchase and improvement of land. It also has financed many other enterprises related to agriculture, such as fertilizer and farm-implement manufacture, reclamation works, hydraulic-power development, the spinning and weaving of silk, flax, cotton, and wool, tea making, and sugar refining. At the close of the war large sums of money were set aside for agricultural-rehabilitation loans.

At the end of 1945, of the funds provided for agricultural credit, 53 percent were used in irrigation projects and 25 percent for agricultural production. Of the amount earmarked for land-credit use, 62 percent was devoted to loans for the

improvement of land and 27 percent to the purchasing of land by tenants. Rates of interest, while considerably below rates asked by private banks, have been between 30 and 48 percent per annum, and recently 60 percent. They were between 9 and 12 percent before the war when private lenders ordinarily got between 24 and 36 percent. Loans to farmers are ordinarily made through an organization, such as a cooperative society or Farmers Association, operating on the principle of unlimited liability of its members.

In general, it may be said that, thus far, the legitimate credit needs of Chinese agriculture have not been met, and the cost of the available credit is excessive. Difficulties under which this service operates, however, are formidable. Credit needs for Chinese agriculture, in total, are enormous and incapable of being met with funds which any bank can now command. Moreover, the cost of servicing small loans is high, and the constantly spiraling inflation makes it impossible for a bank to loan funds at a low rate of interest without heavy subsidy or other income. Therefore, although the Government is not adequately meeting the need for rural credit, one should recognize that it encounters problems in this field which are practically insoluble under present conditions.

**Other Activities.**—Although no attempt will be made to discuss them in detail, mention should be made of two other types of work carried out under the National Government. The first is an inspection service, organized before the war, to enforce standards established for agricultural commodities important in the export trade. Bureaus were set up in the main commercial centers to carry out the work of inspection and testing and to enforce uniform standards. The work of these bureaus was to a considerable degree successful, and it helped to facilitate the export of those commodities.

Second, during the war, under the Ministry of Social Affairs, Government encouragement was given to the organization of cooperatives. These included industrial cooperatives, as well as cooperatives for agricultural, and a great many other, purposes. It was reported that, at the end of February 1947, there were over 160,000 societies, having a total membership of about 20,000,000. Around 60,000 societies are reported to have been devoted wholly or in part to agriculture. Money loaned for their purposes came from the Farmers Bank, and recently in smaller part from the Cen-



tral Cooperative Bank established to service the cooperative societies.

### SUMMARY AND EVALUATION

Obviously, from this review of its activities, a statement that the National Government has done nothing toward improving the economic conditions of farmers would be incorrect. A substantial effort has been made, during the past 15 years, to establish essential agricultural research, set up agricultural colleges, carry on an extension program, develop a regulatory service, construct irrigation facilities, experiment with methods of helping tenants to become owners, extend credit at more reasonable rates of interest, and to carry out an accurate registration of agricultural land. Large staffs have been assembled, and organizations have been created to perform each of these services, all of which are essential in a comprehensive program to develop agriculture and improve the agrarian economy.

On the other hand, in terms of actual improvement of the welfare of rural people, the achievements thus far have been meager. One reason has been the failure of Government efforts to get the needed improvements widely into use on farms and in farm households. This failure leaves some observers with the impression that the Government is doing nothing for the farmer. Colleges, experiment stations, and other organizations seem unrelated to any real interest in the farmer's welfare or intention to bring him help.

There are other weaknesses. Some parts of the program have been soundly organized and pursued and need merely to be carried further; but other parts of the program have been carried out without reference to well-considered objectives, and they need changes in direction and organization. Furthermore, better work in agricultural research, extension, and instruction would be done were these three important services well integrated.

There also are important gaps in the present program: Insufficient attention has been given to taxation, credit, marketing, tenancy, and farm management; compared with its enormous importance, very little has been done to develop forestry; the animal husbandry program is in its beginning; and the same may be said with respect to the different phases of agricultural engineering, including attention to the development of small-scale industries which are needed to provide subsidiary occupations and income for farmers. Most

of these weaknesses in the present program are well recognized by the administrative staff charged with the responsibility of carrying out the Government effort.

A realistic appraisal of the accomplishments of the National Government program, however, must take into account the fact that it is attempting to deal with a many-sided problem of enormous total size. Moreover, it is still in the beginning stages. The difficulties encountered have been increased, basically, because of the newness in China of any scientific work and its application to the improvement of human welfare. Under these circumstances a good many mistakes, much confusion of purpose, and slow progress must be expected until men of experience and mature judgment have been developed, and until the broad outlines of an effective program adapted to local conditions have been clearly defined. The difficulties of China in this respect have not been unlike difficulties experienced at the same stage of development in other countries, including the United States. In China there have been the additional difficulties created by 8 years of an exhausting war with Japan, which interrupted constructive programs and led to increased internal strife and conditions in many parts of the country under which effective activities have become impossible.

At the present time, in many parts of China, the farmers are in desperate need of a change in these conditions. This would entail the following: Peace, lower taxes, and freedom to work and live without fear of disturbance. In some parts of China the difficulties in this respect are less serious than in others, and an energetic agricultural program, broad in scope, would bring considerable benefit to the farmers. In the disturbed parts of the country, many farmers now are oppressed with an almost unbearable burden, whether in territory controlled by the National Government or by the Chinese Communists. Until this situation changes, other efforts to improve the lot of China's rural people would bring them relatively little benefit.<sup>4</sup>

<sup>4</sup> In the statements of this article the writer is not speaking for the Agricultural Mission (see footnote 1). This mission made no attempt to summarize and evaluate the agricultural program of the National Government of China, although most of the points mentioned in this paper appear at one place or another in its report. Besides covering points brought out in this discussion, the recommendations of the Mission make reference to problems of foreign exchange, population, the manufacture of farm supplies, public health, and river conservancy; and the problems of four important agricultural export commodities—tung oil, silk, tea, and carpet wool—are discussed in detail.

## Chinese Communists' Agrarian Program

In a discussion of China's agricultural-improvement program, it is appropriate to include reference to the agrarian program of the Chinese Communists, about which a great deal has appeared in newspapers and other publications. Earlier reports referred particularly to accomplishments in the reclamation of land, labor-exchange groups, regulation of tenancy, lowered interests rates, and the reduction of taxes. Some reference also has been made to the digging of wells, the use of better seeds, and to other measures promoting an increased production of crops. Extensive benefits are held to have accrued to the farm population where the program of the Communists has been applied, and the program is thought by some to provide a solution of the agrarian problems of rural China.

The writer has not been able to observe results of this program at first hand, for no opportunity to travel in the Communist-controlled territory was made available. An examination of reports and claims in the light of other known information, however, makes inescapable a conclusion that no critical evaluation of its accomplishments is yet possible, because the facts are not sufficiently known. Detached studies by qualified specialists, experienced in China and able to make a sound evaluation of what is seen and heard, are not yet on record.

Furthermore, a careful examination of the evidence bearing on certain of the existing claims raises questions concerning their reliability. For example, it has been claimed that the organization of farmers for collective work, as developed in the Yen-an area, might increase agricultural production generally by 50 to 100 percent; and examples are cited of specific cases where the production of crops in given areas was increased by 32 to as much as 81 percent the first year following a change from work on an individual basis to work on a collective basis.<sup>5</sup>

An increase of this magnitude could undoubtedly have been achieved, in a limited area, by reclamation measures bringing more land into cultivation; and this may have been the principal cause of the reported increases. Such measures

might be undertaken with similar results under any type of organization, and indeed they have been obtained in a number of areas under the control of the National Government. However, it also is of interest to observe that, with the semi-arid climate of this region, crop yields of 1 year can be, and often are, as much as 50 or 100 percent greater than those of another, solely as a result of differences in the amount and distribution of the rainfall. The writer has spent 15 years in charge of an experiment station within a few hundred miles of Yen-an, where rainfall and soil conditions are similar, and he sees no sound basis for a generalized statement that the better organization of labor, with a resulting better management of crops in ways to which this report refers, could, in 1 year, cause the crop increases that are claimed.

The land-reform program of the Chinese Communists, to discuss a second example, also is frequently mentioned as an important source of benefit to farmers in this territory. In North China this program appears to have developed through several stages. During the war with Japan, the past distribution of land was largely accepted, and efforts in the main were applied to the reduction of rentals and the carrying out of other measures which safeguarded the interests of tenants. At the close of the war with Japan, a second stage began in many areas, in which farmers were encouraged to "liquidate accounts" with the landlords. To offset what was considered past exploitation, landlords were forced to sell a part of their land to tenants. In the third and most recent stage, more radical measures have resulted in the transfer to tenants, under one provision or another, of a large part of the land formerly held by landlords in Communist-dominated territory.

Without attempting to discuss the merits of procedures followed, it might reasonably be asked, first of all, what proportion of the total farm population in this area would be affected by benefits that may have been introduced through a land-reform program. Most of the territory under consideration is in the wheat-growing region of North China and not in the rice-growing regions where tenancy is far more prevalent. The statistics already referred to<sup>6</sup> show that, in a limited number of localities of North China, between 30 and 60 percent of the farmers were tenants; and the number of such localities could have increased to some extent during the war, because farmers may

<sup>5</sup> HSU, YUNG-YING. COOPERATIVE ECONOMY IN YENAN. *Sci. and Soc.* 10; 17-40. New York. Winter 1946.

<sup>6</sup> See reference cited in footnote 2.



be forced to sell land to sustain life where constant disturbances or serious national disasters occur. However, since areas outside of Communist control affected in these ways did not make up a large proportion of the whole region, the situation as a whole should not differ greatly now from the situation shown by surveys made before the war.

Investigations<sup>7</sup> in 52 localities of 49 hsien of Kansu, Suiyuan, Central Shensi, Shansi, Hopeh, and Shantung Provinces showed, on the average, that 77.0 percent of the farmers were owners and 17.2 percent were part owners, who rented part and owned part of the land. Only 5.8 percent were full tenants. Gamble<sup>8</sup> reports, from a survey of 400 farms undertaken in the experimental district of the National Mass Education Movement in Tinghsien, Hopeh Province, that 61.0 percent of the farmers were owners, 33.8 percent were part owners (owning 66 percent and renting 34 percent of the land they cultivated), and 5.2 percent were tenants. For the entire hsien he states that owners constituted 70.5 percent, part owners 25.0 percent, and tenants 4.5 percent of the farmers.

Since the part owners in both these studies owned more land than they rented, the economic

position of this group in most cases would not have been greatly improved by becoming full owners. Thus only a relatively small percentage of the population of this region as a whole would have benefited to any considerable extent by land reform. In evaluating the importance of these benefits, moreover, it is to be remembered that land reform is not a cure-all. While ownership may bestow important benefits to farmers able to handle the responsibilities that go with it, the owners of land must also pay the land tax; and the acquisition of ownership constitutes only one of a number of improvements needed to raise the economic level of China's farmers. Ownership and an even distribution of land still mean poverty unless a farmer can produce more.

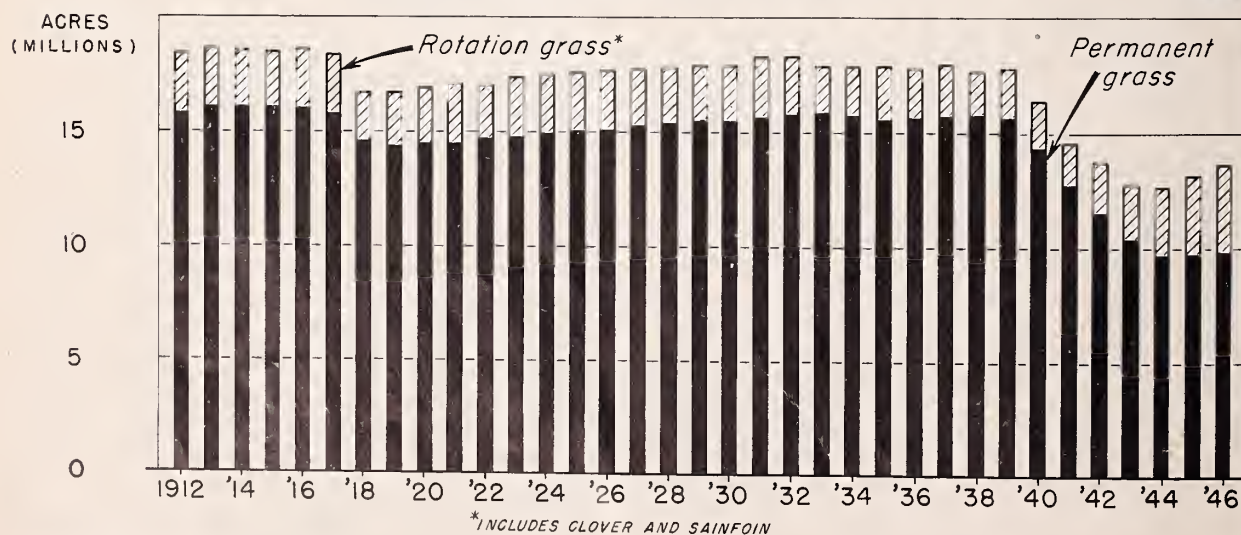
In the light of information of this sort, therefore, reasons are seen to doubt the extent to which claims now on record are valid. It appears probable that some of them are of doubtful validity or exaggerated.

On the other hand, in view of the urgent need to improve the economic and social conditions in China's rural areas, it should readily be agreed that China would profit by an unbiased investigation of the total agrarian program of the Chinese Communists, and by the adoption of useful practices that can be applied with democratic procedures, as they may be discovered.

<sup>7</sup> See reference cited in footnote 2.

<sup>8</sup> GAMBLE, SYDNEY D. FOUR HUNDRED CHINESE FARMS. Far East. Quart. Vol. IV, No. 4. August 1945.

### ACREAGE IN PERMANENT AND ROTATION GRASSES IN ENGLAND AND WALES, 1912 - 46





# Research and Practice In Ley Farming

by WILLIAM DAVIES\*

During the recent war, British plans to increase agricultural production centered largely in a plow-up program designed to turn grasslands into cultivated crop acreage. Subsidies were paid to those farmers who cooperated by plowing up and utilizing grassland for various crops, particularly grain. Thus, crop production was greatly expanded to add thousands of pounds to Britain's ebbing food supplies and to aid materially in the Allied war effort. In future plans for agriculture, emphasis is expected to be placed upon ley (rotation-grass) farming rather than upon the permanent grasslands so long a feature of British land use.

A brief preliminary account of the history of farming in Britain may be of assistance in understanding the latest developments of British farming technique. Under the manorial system which followed the feudal system, established 1,000 years ago by William of Normandy, the land was held in large estates by the lords of the manor. Although the rights of the common man were extended under the manorial system, he was still controlled by his lord. In manorial times there was, however, sound intensification of the systems of farming; but no great headway could be made in farming technique, because land was held in common. In other words, a village community had common rights to certain parts of the manorial estate.

The next change which affected farming technique came in about 1730 when the Government of that day passed a series of Enclosure Acts. The people disliked these acts, but nonetheless the enclosure of land throughout southern Britain marked the beginning of real progress in farming technique. The land was then held in large estates, but in the intervening years these have been largely broken up, and the Britain of today is a country of relatively small farms.

Following the enclosures of the eighteenth century, the area of tillage land at first increased sharply during the latter half of that century and then on up to 1820 and the Napoleonic wars. Immediately thereafter British farming became less

prosperous, but the general prosperity of the country was regained with rapid development of industry during the nineteenth century.

## Golden Age

The peak of arable cultivation probably coincided with the "Golden Age of British Agriculture," the period 1865-75. Between 1875 and 1879 a series of poor harvests occurred, which, together with the impact of agricultural imports from overseas, created what amounted to a depressed industry. As a consequence, extensive areas of arable land were laid down to permanent grass between 1875 and 1914.

World War I halted this process, but it was again resumed from 1920 to 1939. During these years, Britain attained to a high peak of permanent grassland and an aggregate total of nearly 16,000,000 acres of permanent pasture in England and Wales.

In the official agricultural statistics of Britain, collected annually by the Government, a distinction is made between permanent and rotation grasses. This distinction is by no means absolute, because a great deal of the permanent grassland of Britain has been under the plow at one time or another. Much of the older rotation-grass fields (old leys), in fact, differ in no essential respect from the land in permanent grass.

Before the outbreak of World War II the grasslands of Britain were in a depleted condition. Many of them had become practically derelict, and in their condition in 1939 they fell little short of being rough grazing lands.

Of a total of some 16 million acres of permanent grass existing in England and Wales in 1939, no less than 65.2 percent consisted of poor, unproductive pasture land that contributed little to the national wealth. Only 7.4 percent, representing less than 1.25 million acres of permanent grasslands, could be regarded as really first-class, that is, producing animal food at a high level.

The remaining 27.4 percent consisted of moderate grasslands, all of which could be brought to

\*Director, Grassland Improvement Station, Stratford-on-Avon, Warwickshire, England.

the highest standard by adequate farming. In addition to permanent grasslands, there were in England and Wales some 5.5 million acres of rough and hill grazings, a considerable proportion of which were improvable. The facts of prewar days were, therefore, that there was an aggregate of something over 21 million acres of grasslands, excluding some 2 million acres of leys.

The total agricultural area in England and Wales approximates 30 million acres. Of this total at least two-thirds of the land surface in 1939 was not yielding all that it could. The big problem that faced the agricultural community in Britain, therefore, was to remove this dead weight of unproductive permanent grass. Arable agriculture, representing less than a third of the whole, was reasonably efficient. Pastoral agriculture could only be regarded as wholly inefficient.

This was the condition at the outbreak of World War II. Through the medium of the War Agricultural Executive Committees, Britain began to grow arable crops for human consumption. In the intervening years over 6 million acres of grasslands, have been plowed up, although rough and hill grazings have been hardly touched.

The technical problem regarding these may be considered as more or less solved. There remain sociological problems, connected with the development of our hill lands, that still await solution on the widest national basis.

Even though Britain plowed up 6 million acres of permanent grass during the war years, nearly 10 million acres of permanent grass still await the plow. Many of these grazing lands are more productive today than they were in 1939. They will not attain to full production until they are plowed up and put to arable usage, which includes the ley.

## A Livestock Country

Although arable cultivation was an important part of Britain's prewar agriculture, grain growing did not provide the basis of its agricultural wealth. Britain is a livestock country and is likely always to be so. The aggregate wealth from its

grasslands, even in prewar days, greatly exceeded that of any arable crop.

The war years have appreciably changed all this. Pioneer thought regarding the future of Britain's agriculture is based on ley farming and the exploitation of the ley technique.

Ley, or rotation grass, will be regarded as a pivotal crop around which the arable rotation is revolved. Compared with permanent grass, the ley is more efficient, not only as a producer of animal food, but also as a soil restorer. The ley farmer has been able to extend his grazing period from 26 to as much as 40 weeks in the year as compared with 10 or 12 weeks' production provided by the usual run of permanent grass.

Looking to the future, pioneering farmers are aiming toward a permanent grazing season, when they can offer to their grazing animals nutritious and succulent food for the whole of the year. Current researches at the Grassland Improvement Station, Stratford-on-Avon, and elsewhere in Britain, are being canalized with this same end in view.

## Plant-Breeding Work

The essential basis of ley farming has been well understood by advanced technicians in Britain since the time of Gilchrist (1906). Professor Gilchrist was the real founder of the thesis of ley farming. He emphasized among other things the value of using a sensible seeds mixture. His work was followed up at Aberystwyth. The work of the plant breeder can be of no avail unless his material is used by the practical farmer. The plant-breeding work at Aberystwyth, with the development of the new strains, has been followed by a scheme of seed registration on a national basis. This guarantees to the consuming farmer that the seed he buys under a certificate number will represent the strain that he wants.

During the war Britain greatly extended its home seed-production industry to make the country self-supporting and, if necessary, an exporter of these special strains of grasses and legumes. This will involve careful organization and regis-



tration of stocks from plant breeder to practicing farmer. Already many of these new strains have been tested in overseas countries, including Scandinavia, Germany, Holland, and other parts of Europe, Canada, United States of America, the Falkland Islands, and South America, as well as temperate Australia and the temperate Union of South Africa.

On the whole, the results from overseas trials have been eminently satisfactory, particularly where under temperate conditions the demand is for long-duration leys. One of the major issues in the investigational program of the Grassland Station; at Stratford-on-Avon, is connected with the problem of extending the grazing season to as near all-year-round as possible. In connection with this thesis, the station is deeply involved in the examination of the following, among other grassland problems:

(1) The agronomic study of seeds mixtures, including the testing of species and strains from both Britain and overseas.

(2) Problems connected with greater efficiency in seed-production methods in herbage plants.

(3) The agronomic study of lucerne (*Medicago sativa*, et al.) as a grazing and forage plant.

(4) The influence of particularized types of sward on animal yields, including dairy produce, meat, etc.

(5) Problems connected with extension experiments all over Britain, involving the testing of the research findings over the widest possible range of soil and weather conditions.

(6) Closely related to the latter series of trials is the whole grassland advisory scheme, henceforward the concern of the new National Agricultural Advisory Service with which the Station is intimately connected.

If the work of the Research Station is to bear fruit, the Research Investigator and the Advisory Officer must work in close collaboration. Both of them must also be deeply concerned with the farming community, whose interest in research and investigation must be maintained at all times. Rapid progress toward still greater efficiency in Britain's agricultural industry will, to a tremendous extent, depend upon how good are the contacts maintained between science and practice.

# Canadian Farm-Rehabilitation Policy

by MARY E. LONG\*

The Canadian program of Prairie Farm Rehabilitation, applying to certain portions of the three Prairie Provinces, has been remarkably successful. Consequently, much pressure has been exerted on the Dominion Government to extend the areas to which it is applicable. Although no general extension has been granted, the Government is reported to favor the negotiation of agreements with individual Provinces for rehabilitation projects under certain conditions.

Legislated farm rehabilitation in Canada is of comparatively recent origin. It was adopted as an outgrowth of the Canadian Government's responsibility in the restoration of certain portions of the Prairie Provinces known as the Palliser Triangle; including, roughly, a small part of southwestern Manitoba, practically all the southern half of Saskatchewan, and an estimated one-third of southern Alberta. Much of this land,

even though known to be submarginal, had been governmentally sponsored for settlement and cultivation during the era of accelerated prairie settlement following 1900. Thus, when the combination of extreme drought, extensive soil erosion, and low prices for agricultural commodities during the 1930's resulted in severe hardship and suffering to the farmers in this area, the Government was forced to render assistance in order to avoid widespread destitution.

The basic principles underlying this relief policy endeavored to ensure the most economical utilization of the limited supply of soil moisture for crop production, the prevention of drifting, reclamation of farm land (abandoned or farmed), and the promotion of the most suitable use of land in both crop production and grazing.

While the original Prairie Farm Rehabilitation Act passed by the Canadian Parliament in 1935 provided little more than the authority for small water developments, later amendments have not

\*Office of Foreign Agricultural Relations.

Based in part on BATES, QUENTIN R. NEW POLICY OF FARM REHABILITATION IN CANADA. U. S. Cons. Rpt. 175. 3 pp. Ottawa, Canada. June 3, 1947. [Hectographed.]



only extended the provisions of the act for an indefinite period but have also developed a threefold program of operations; namely—

(1) Land utilization and resettlement—to provide for the designation of large areas of sub-marginal land as community pastures and reserve areas complementary to the grain-growing activities of farmers in surrounding regions; thus, making livestock a basis of farm economy rather than grain production exclusively.

(2) Water development—to create irrigation projects for the resettlement of farmers who are moved from lands taken out of production, as well as for the development of surface water to be used for stockwatering and small-scale irrigation on individual farms.

(3) Cultural—to promote self-reliance of farmers by means of Government demonstration and technological instruction; to enable the farmer to remedy the evils of drought and soil erosion through the adoption of such cropping methods and improvements as will secure the maximum returns from farming.

The success of the long-term land-utilization policy of the three Provincial governments of Alberta, Manitoba, and Saskatchewan, in cooperation with the Dominion Government, is reflected in the various accomplishments of the Prairie Farm Rehabilitation program to date. Construction of large irrigation projects has been a particularly important function, and latest statistics show that 98 projects have been improved or constructed providing irrigation facilities for 180,000 acres previously subject to drought. Strip farming as a method of soil-drifting control has been generally adopted throughout the Prairie Prov-

inces, and a rapid increase has also been noted in the development of community pastures as a method of absorbing submarginal land for productive farming purposes.

Thus, as a result of the outstanding achievements of the Prairie Farm Rehabilitation program in its short period of existence, severe pressure has recently been brought upon the Dominion Government to extend the provisions of the Prairie Farm Rehabilitation Act.

At present, the Government does not seem favorably inclined toward the extension of the provisions of the act to all of Canada, but it is agreeable to a plan of Dominion financial assistance for rehabilitation works, in any or all of the Provinces, provided they benefit the country as a whole and are too costly for provincial or municipal development. In this connection, the Government has recognized that some tentative projects might benefit Canada as a nation through a possible increased productivity of certain farm areas, such as (1) the dike or marshlands of Nova Scotia and New Brunswick, (2) certain farm lands in British Columbia, and (3) lands in various parts of the Dominion which have not previously been utilized as cultivated areas, but which if developed would provide increased employment and home-building sites.

Before any authorization of expenditure of Dominion funds might be given for any of the above-suggested projects, it would be necessary for the Provinces concerned to enter into specific agreements with the Canadian Government outlining definite plans which would ensure the completion of the project within a specified time, not to exceed 5 years.

## International Collaboration Reports

The report of the China-United States Agricultural Mission was issued by this Office as one of a series entitled International Agricultural Collaboration. This series includes reports that present the results of field investigations and research under the broad authorized program of inter-governmental technical collaboration in agriculture carried on by the U. S. Department of Agriculture in cooperation with officials and technicians of other governments.

The China-United States Agricultural Mission submitted its report to President Chiang Kai-shek

in China and to President Harry S. Truman in the United States, upon completion of its work. This report was released to the public in both countries on February 24, 1947. A translation in the Chinese language was circulated in China. The English version, first issued in a preliminary mimeographed form, has been edited and published as Report No. 2 of the International Agricultural Collaboration series. Address requests for copies to the Office of Foreign Agricultural Relations, U. S. Department of Agriculture, Washington 25, D. C.

b

